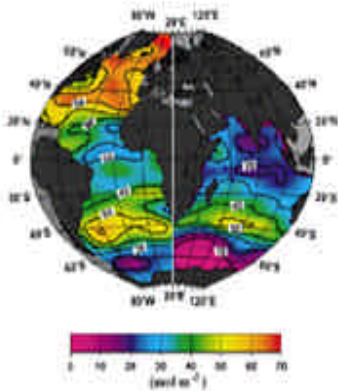




FY 2003 President's Request

Climate Change Research Initiative: Carbon Monitoring



Estimate of carbon dioxide emitted by humans stored in the ocean; red-orange indicates high storage; blue-violet indicates low.



Tall tower used for carbon dioxide measurements.

What is requested?

In his June 11 speech at the Rose Garden, President Bush announced the establishment of the U.S. Climate Change Research Initiative (CCRI) to address the Administration's commitment to study areas of scientific uncertainty and to identify priority areas where investments can make a difference. As part of CCRI, NOAA requests \$2 million to augment the carbon monitoring capabilities in North America participating with other agencies in the Integrated North American Carbon Study (NAC), a priority of the Carbon Cycle Science Plan.

Why do we need it?

Carbon is the basis for the food and fiber that sustain human populations. It is the primary energy source that fuels human economies, and it is a major constituent of the greenhouse gases accumulating in the Earth's atmosphere that are the basis for potential changes in global climate. Carbon dioxide (CO_2) and methane (CH_4) concentrations in the atmosphere are now higher than they have been for over 400,000 years. Combustion of fossil fuels and land clearing over the past 150 years are the source for most of this increase. Today, only about half of the carbon dioxide released to the atmosphere annually by human activities remains in the atmosphere. The other half is being taken up by trees and other plants on the land and by plants and chemical processes in the ocean. Since trees, plants, soils, and the ocean also release carbon to the atmosphere as part of their overall functioning in the Earth's carbon cycle, it is of great importance to quantify the size, power, and longevity of these sinks. Active management offers opportunities to offset carbon emissions by enhancing the storage of carbon in plants, soils, and forest products as well as in the oceans, although the time scales over which these practices can remain effective are unknown. One of the uncertainties in future climate projections is knowing how the cycling of carbon will change as climate and land use patterns change.

What will we do?

CCRI targets multi-agency resources for an intensive focus on North American land and adjacent ocean basin carbon sources and sinks. Other priorities include improving monitoring techniques, reconciling approaches for measuring carbon storage, and elucidating key processes and land management practices regulating carbon fluxes between the atmosphere and the land and ocean. The study calls for expansion of the AmeriFlux sites (DOE), a system of sensors that take direct and long-term measurements of carbon dioxide and water vapor fluxes between terrestrial ecosystems and the atmosphere. It also calls for the development of automated carbon dioxide and methane sensors (NASA, NOAA), improvements in ground-based

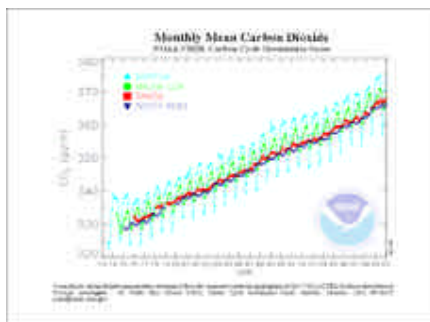


Diagram showing monthly mean carbon dioxide measurements.



The Mauna Loa Observatory in Hawaii measures up to 250 different atmospheric parameters, including carbon dioxide concentrations.



For more information:

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measurements and inventories of forest and agricultural lands, and improved modeling efforts (NSF).

NOAA's contribution to the NAC program will continue efforts that were initiated in FY02 to measure vertical profiles of atmospheric carbon dioxide at regional scale. Five sites are planned with FY02 funds and about 10 sites are planned with FY03 funds. While the optimal spatial configuration and temporal frequency is not yet certain for this network, the implementation of some of the network will provide valuable data and insights in proceeding to the full establishment of the required network. At present the strategy aims at sites at both east and west coasts and north border. At least one site at each U.S. region will be established, encompassing geographic areas with distinct weather patterns. The measurements will primarily be obtained with aircraft flights, and some of these sites will be collocated with the tall towers. In addition to atmospheric measurements, carbon dioxide flux measurements over the North Atlantic and North Pacific will be made, by providing more pCO₂ sensors to ships of opportunity, in further augmenting investments made in FY02.

What are the benefits?

The goals of the program can only be achieved with a multi-agency coordinated effort. The combined results will quantify the North American region's carbon sources and sinks, describe the natural and human system processes controlling changes in them, and document North America's contribution to the Northern Hemisphere carbon sink. The final product is maps of carbon sources and sinks with reduced uncertainties in regional US scale. Such products represent a critical step in utilizing research and science-based information delivered to policy and management decision makers, and will be increasingly more critical in the future.

The nation and the world are entering an era in which carbon cycle issues lie at the core of several policy debates centered on future climate change and its consequences for humans. What will be the future atmospheric concentrations of carbon dioxide and methane resulting from environmental changes, human actions, and past and future emissions? To what extent can forest and agriculture management be used to effectively offset emissions of carbon from fossil fuel combustion, regionally, nationally, and globally? How will the natural processes that store carbon in the oceans and on land change in the future? And what are the prospects for feedbacks within the climate system, especially large increases in carbon emissions from the land and oceans? Will food security increase or decrease as the composition of the atmosphere continues to change? How do the prospects for carbon storage through increasing the growth of trees and plants compare to and interact with the prospects for storing carbon in the deep oceans and in geological formations?

NOAA Budget

FY2003 Change
\$ millions

Climate Research
Climate Observations and Services
Climate Change Research Initiative

\$18